

## **AN ADJUSTABLE DETERGENT DISPENSER FOR WATER CLEANERS.**

### **BACKGROUND of the INVENTION.**

The invention relates to a water cleaner in which the operator can easily regulate the quantity of a detergent which is dispensed in relation to a quantity of water delivered.

In the field of equipment and spray-guns for water-cleaners, the prior art teaches application downstream of the gun of devices for injecting a  
5 predetermined dose of detergent into the water.

These devices aspirate detergent from a special container employing a Venturi-type effect, in which a depression is created in an expansion chamber as a result of the velocity of the water pumped by the cleaner.

10 The prior art also includes devices enabling a regulation of the delivery of the detergent, i.e. a change in ratio between aspirated detergent delivery and water delivery.

These known devices are generally constituted by a calibrated nozzle inserted in the detergent aspiration conduit, the nozzle being interchangeable. Thus by  
15 changing the nozzle the detergent flow rate is also changed.

Other known detergent dispensers with regulatable delivery include a vacuum-breaker valve on the expansion chamber. The vacuum-breaker can be calibrated, so the degree of vacuum can be varied in the expansion chamber and therefore the aspirated detergent fluid can also be regulated.

20 The above-described devices present various drawbacks.

Firstly, the nozzles inserted on the detergent aspiration conduit are subject to blockages during operation, reducing or even interrupting delivery of the detergent.

Further, it is a nuisance to have to substitute the nozzle according to the detergent and flow rate required, as it involves having replacement nozzles to hand, which is not always the case with water cleaning apparatus.

Finally, it is not immediately obvious which nozzle is installed due to poor legibility from the outside, so the flow rate ratio, i.e. the ratio between the detergent and water delivery, is not evident unless the nozzle is first dismantled and/or replaced.

In the case of regulation devices equipping vacuum-breaker valves, there is a risk of blockage or loss of accuracy, but especially there is a lack of precision in determining the exact value of the desired dispensing ratio.

#### **SUMMARY of the INVENTION.**

The main aim of the present invention is therefore to obviate the above-cited drawbacks present in the prior art, by providing an adjustable detergent dispensing device for water cleaners which has no need of substitution of parts when the flow rate of the detergent is to be changed (i.e. in the change of water/detergent ratio), and in which the selected ratio is clearly legible, and which is easily washable to remove the deposits which inevitably build up in the aspirating conduits due to using a detergent.

#### **BRIEF DESCRIPTION of the DRAWINGS.**

These and other aims besides are all attained by a regulatable detergent dispensing device for water cleaners, as it is described in the appended claims. Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of non-limiting example in the accompanying figures of the drawings, in which: figures 1A, 1B and 1C show, in a vertical axial plane and in section, the three parts which constitute the device, represented in dismantled position

according to the vertical insertion axis, and respectively constituted by the body of the device, the aspiration conduit with upper head, and a recipient for containing detergent;

figure 2 shows, in a vertical axial plane, and in section, an enlarged detail of the body of the device of figure 1A, and the head of the aspiration conduit of figure 1B, correctly mounted in operating configuration;

figure 3 is a view of the body of the device of figure 1A seen from plane A-A in figure 1A;

figure 4 is a view from above of the head of the aspiration conduit of figure 1B;

figures 5A, 5B, 5C each show a detail of the aspiration conduit head of figure 1B, respectively shown vertically sectioned along lines B-B, C-C and D-D.

#### **DESCRIPTION of the PREFERRED EMBODIMENTS.**

With reference to the figures of the drawings, 1 denotes the body of the device in its entirety; 2 denotes a threading for connection to a water-gun, not shown in the figures.

3 denotes a tapered chamber for containing water under pressure, which ends with a fixed nozzle 4; together, the chamber 3 and the nozzle 4 constitute a water ejector.

5 denotes an expansion chamber in which, by a Venturi effect, a depression is caused by action of an exiting jet from the nozzle 4.

6 represents a nozzle and 7 a delivery mouth for the jet.

8 denotes a hole connecting the expansion chamber 5 with an underlying chamber 9 delimited by the trunco-cylindrical wall 10.

11 denotes a series of notches, arranged in diametrically-opposite couples on the lower edge of the trunco-cylindrical wall 10. The notches 11 are destined to contact respectively with a pair of teeth 20 fashioned on the aspiration

conduit 15 head 16, when the aspiration conduit 15 is placed in operating position on the device.

12 denotes a lower connecting portion of the body 1, destined to connect in a bayonet joint with teeth 29 located on the neck 30 of the detergent container  
5 31.

A numbered scale (numbered from 1 to 6, the numbers being equidistanced) is located on the lower edge 13 of the connecting portion 12.

The head 16 of the aspiration conduit 15, shown in detail in figures 4 and 5, is constituted by: a wide plate 17, destined to contact against the trunco-  
10 cylindrical wall 10; by a trunco-cylindrical drum 18 an external wall of which exhibits an o-ring 19 made of an elastomer material; and by a flat upper part 21 on which radial channels 22A, 22B, 22C, 22D and 22E are afforded, having different depths and being angularly equidistanced radially and being of a number which corresponds to the numbering written on the lower edge 13 of  
15 the connecting portion 12. In the illustrated embodiment, the channels are 5 in number, as there are 6 numbers on the lower edge 13 (a sixth number being zero).

The aspiration conduit 15 is internally hollow and exhibits an axial hole 23, while externally the aspiration conduit 15 exhibits a fixed tab 24 which  
20 indicates the angular position of the aspiration conduit 15.

The container 31 of detergent, which can be variously shaped in a main body thereof, at a top thereof exhibits a rigid neck 30 having two joint teeth 29 and a collar 28 which, when the apparatus is assembled, contacts against the internal part of the lower edge 13 of the connecting portion 12.

25 The above prevalently structural description is now followed by a description of how the invention operates.

Starting from the disassembled situation, represented in figures 1A, 1B and

1C, the operator first inserts the aspiration conduit 15 into the chamber 9 of the body 1 of the device, coupling the drum 18 on the walls 10 of the chamber 9. This coupling is solid thanks to the action of the o-ring 19 on the head of the drum 18; which exerts a mechanical gripping action on the body 1 and the  
5 drum 18 as well as a hydraulic sealing action.

The coupling also causes the teeth 20 to couple with a pair of notches 19 in a variety but limited number of positions, which in the embodiment are six in number.

The positions are indicated by the position of the tab 24 with regard to the  
10 numbers written on the circular crown of the lower edge 13; thus it is easy to know the angular position in which the head 16 of the aspiration conduit 15 has been installed on the chamber 9.

This tab position indicates a situation in which one of the channels 22A, 22B, 22C, 22D, 22E coincides with the hole 8 giving access to the expansion  
15 chamber 5.

A sixth position is provided, in which there is no coinciding channel 22. This means that in the sixth position the hole 8 is stopped, and the tab at this position will be aligned with position number 0.

Finally the operator inserts the neck 30 of the container 31 on the connecting  
20 portion 12, closing the bayonet joint with the teeth 29.

This operation is possible only if the teeth 20 have correctly entered into one of the pair of notches 11. For this reason, the upper edge 25 of the neck 30 strikes against the plate 17, obliging it to settle in the correct position.

The closure position of the neck 30 is illustrated in figure 2.

25 Should the teeth 20 not enter the notches 19, the bayonet joint involving the teeth 29 of the container neck 30 and the notches 14 will not be properly effected; also, the collar 28 would not perfectly settle on the lower edge 13.

Pressurised water can be introduced into the chamber 3, causing aspiration of the detergent in the pathway connecting the hole 8 with the aspiration conduit 23 through the preselected channel 22.

As the depth of the channels 22 is different, according to the angular position  
5 of the conduit 15 the flow rate of the aspirated detergent will be different, as the loss of head in the channel 22 will be of different entities. The height of the channels 22 is comprised in an interval going from 0 (position zero) to 1 mm (deepest channel).

Alternatively to a multiplicity of radial channels 22 having different depths, it  
10 would be possible to have a continuous variation in the height of the aspiration conduit head 16 at a channel 22 according to the angular position of the conduit 15. This is obtained by helically shaping the upper part 21 in a wide radial arch shape, starting, for example, from level 0 (zero) and going up to the maximum depth of the deepest channel 22. This would give rise to a helical  
15 space between the aspiration conduit head 16 and the body 1 at the chamber 9; and this would lead to a variable height in the helical space at the base of the hole 8, and therefore a different loss of head of the detergent in that zone.

The aim of enabling selection of the most suitable flow rate value is thus achieved, with a simple mounting operation in the desired position of the  
20 conduit 15. It is also easy to clean the channels 22 of the connecting conduit between the expansion chamber 5 of the ejector and the aspiration conduit 15, as the latter part can be mounted and dismounted easily from the body 1 of the device.